

AMENDMENTS TO THE SPECIFICATION:

Please replace the title with the following:

Method and Apparatus for Coupling Optical Elements to Optoelectronic Devices for  
Manufacturing Optical Transceiver Modules

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Please replace lines 26-27 on page 8 of the present application with the following:

**FIGS. 11a-11c** are diagrams illustrating an apparatus for holding an optical element in  
accordance of an embodiment of the present invention.

- 10 Please replace paragraph starting at line 28 on page 32 with the following amended  
paragraph:

**FIG 11a** illustrates an apparatus of a high-precision alignment machine 1150, which  
may be used in combination with a series of other apparatuses to produce precise alignment  
and attachment of optical fibers to optoelectronic devices. These machines combine many  
15 critical technologies to perform alignment with a low-cost manufacturing environment. These  
technologies include: (1) a high-precision stage 1152 that is used to hold the flexible printed  
circuit board 102; (2) a high-precision alignment arm 1154 for accurately placing the first  
ferrule 112 on the optoelectronic devices 106 that are adapted to the flexible printed circuit  
board 102; (3) a top-down view camera 1156; (4) side-view camera 1158; (5) video monitors  
20 1160; (6) split-field microscope 1162; and (7) an optical video machine vision system 1164  
which function together with human vision 1166 to replace the labor-intensive active-  
alignment process. In one embodiment, a touch sensor 1168 is used to determine the position  
or space between the array of optical fibers and the optoelectronic devices. Alternatively,  
computers and software may function within the machine vision system 1164 to perform  
25 many of the above stated technologies in place of human vision 1166. An example of one of  
the many processes that may be used with this equipment is explained in the following  
paragraphs.

Please replace paragraph starting at line 11 on page 33 with the following amended paragraph:

The first step in the precise alignment and attachment of the first ferrule 112 to the array of optoelectronic devices 106 is to hold the first ferrule 112 at the end of a high-precision stage 1152. This is accomplished through the use of an apparatus for holding an optical element, as explained in this section.

Please replace paragraph starting at line 15 on page 33 with the following amended paragraph:

**FIGS. 11a—11b 11b-11c** show views of an embodiment of the apparatus for holding an optical element. The apparatus for holding an optical element 1100 holds the first ferrule 112 through the use of pin-positioning holes 1102 and vacuum pressure. The apparatus for holding an optical element has a first end 1112 and a second end 1114. The apparatus for holding an optical element 1100 may have two pin-positioning holes 1102 on a bottom surface 1104 of the second end 1114 for receiving the alignment pins 316 of the first ferrule 112, as shown in **FIGS. 11a—11b 11b-11c**. As shown in **FIG. 11[b]c**, an array of optical fibers 1106 may be packaged between the pin-positioning holes 1102, and it is optically aligned with the array of optical fibers 114 that are packaged in the first ferrule 112. The innermost optical fibers in the apparatus for holding an optical element 1100 are milled out, forming a longitudinal cavity 1108 running through the apparatus for holding an optical element 1100 from the first end 1112 to the second end 1114, as shown **FIG. 11[b]c**. A vacuum is placed at a top surface of the first end 1112 of the longitudinal cavity 1108, and the longitudinal cavity 1108 functions as a vacuum slot. Accordingly, once the alignment pins 316 from the first ferrule 112 are mated with the pin-positioning holes 1102 on the apparatus for holding an optical element 1100, the vacuum slot functions as a vacuum clamp, holding the first ferrule 112 in place. Alternatively, an electrostatic clamp may be used in place of the vacuum clamp. Also, another embodiment may comprise alignment pins in place of the pin-positioning holes 1102, and the alignment pins would function to connect to pin-positioning holes in a ferrule.